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EXAMINER	
DESIR, PIERRE LOUIS	

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	10/682,090	SMITH ET AL.
	Examiner	Art Unit
	Pierre-Louis Desir	2681

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

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DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-35 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 12-13, 15-16, 30, and 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munoz-Garcia et al. (Munoz-Garcia), U.S. Patent No. 6340948, in view of Gross et al. (Gross), U.S. Patent No. 6307507.

Regarding claim 1, Munoz-Garcia discloses a system for operating an array antenna (see abstract), the array antenna having a plurality of antenna elements (i.e., radiating elements) (see fig. 3, col. 5, lines 22-23), comprising: a feeding port (i.e., feed link antenna or input port or output port) (see figs. 2-3); a plurality of signal shifters for respective connection to the plurality of antenna elements (i.e., plurality of phase shifters) (see figs. 4-5, col. 6, lines 22-23); and an adaptive beamformer (see col. 2, line 25) configured to distribute input signals from the feeding port to the plurality of signal shifters (i.e., modulated signals are supplied to respective input ports of an analogue beam former, which generates a plurality of energizing signals for energizing radiating elements of the transmit array antenna, wherein each beam port is connected

to antenna port via phase shifter components) (see fig. 3, col. 5, lines 19-27, and col. 11, lines 4-6) and to combine output signals from the plurality of signal shifters for output to the feeding port (i.e., the dividers receive two input analogue RF signals, and output two RF signals, wherein the RF signal supplied to any one of the inputs is fed, in progressively incrementing phase shifts, to each of the elements of the array) (see col. 1, lines 41-53).

Although Munoz-Garcia discloses a system as described above, Munoz-Garcia does not specifically discloses a system wherein a plurality of operating modes being associated with respective array antenna gain patterns having different beamwidths.

However, Gross discloses a system wherein a plurality of operating modes being associated with respective array antenna gain patterns having different beamwidths (i.e., the phase antenna array could be enabled to operate in a mode having a broad, low power, low bandwidth beam and could also be enabled to operate in a mode having narrow width beams) (see col. 6, lines 18-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine both teachings to arrive at the claimed invention. A motivation for doing so would have been to provide a system wherein a single antenna may be used to generate a large number of beams, with improved beam coverage and reduced dropoff (Munoz-Garcia col. 3, lines 16-19).

Regarding claim 2, Munoz-Garcia discloses a system (see claim 1 rejection) wherein the adaptive beamformer comprises a plurality of beamformers (i.e., beam formers 20, 120) (see col. 6, lines 13-24), each beamformer distributing input signals from the feeding port to (see fig. 3, col. 5, lines 19-27, and col. 11, lines 4-6, also refer to claim 1 rejection), and combining output

signals from, particular ones of the plurality of signal shifters (see col. 2, lines 54-60, and col. 4, lines 24-28, and col. 6, lines 13-24, also refer to claim 1 rejection).

Regarding claim 3, Munoz-Garcia discloses a system (see claim 2 rejection) wherein the plurality of beamformers comprises a first beamformer for distributing input signals from the feeding port to, and combining output signals from, each of the plurality of signal shifters (i.e., Munoz-Garcia discloses two analogue beam formers, wherein each analogue beam former 20,120 consists of two orthogonally connected stacks. In the beam former, four-port power dividers with associated phase shifters, receiving input signals and feeding a linear array of spaced elements. The dividers each receive two input analogue signals, one of which is phase shifted, and output two RF signals. The effect of the array of dividers and phase shifters is that the RF signal supplied to any one of the inputs is fed, in progressively incrementing phase shifts, to each of the elements of the array. Thus, the array acts as a phased array, generating a beam at an angle dependent upon the phase shift increment (which depends upon the number of radiating elements) and the element spacing. Therefore, one skilled in the art would immediately conceptualize that both beamformers distribute input signals and combining output signals from the plurality of phase shifters (see col. 1, lines 41-53, and col. 5, lines 13-17), and a second beamformer for distributing input signals from the feeding port to, and combining output signals from, a subset of the plurality of signal shifters (see col. 1, lines 41-53, and col. 5, lines 13-17).

Regarding claim 4, Munoz-Garcia discloses a system (see claim 3 rejection) wherein the subset of the plurality of signal shifters comprises signal shifters for connection to two centre antenna elements of the plurality of antenna elements (i.e., the array antenna comprise of a plurality of radiating elements (including the radiating elements which are in the center), which

are connected to a corresponding output port ach of the beam formers, wherein the array can be offset relative to the other by providing a phase shifting device (inherently comprises of phase shifters)) (see figs. 10-11, col. 9, lines 39-62, and line 66 through col. 10, line 19).

Regarding claim 12, Munoz-Garcia discloses a system (see claim 1 rejection) wherein the array antenna comprises a patch array antenna (see col. 10, lines 39-42), and wherein the plurality of antenna elements comprises a plurality of columns of radiating elements (see abstract).

Regarding claim 13, Munoz-Garcia discloses a system as described above (see claim 1 rejection).

Although Munoz-Garcia discloses a system as described, Munoz-Garcia does not specifically disclose a system wherein the plurality of operating modes comprises at least a first operating mode associated with a first array antenna gain pattern having a first beamwidth and a second operating mode associated with a second array antenna gain pattern having a second beamwidth narrower than the first beamwidth.

However, Gross discloses a system wherein the plurality of operating modes comprises at least a first operating mode associated with a first array antenna gain pattern having a first beamwidth and a second operating mode associated with a second array antenna gain pattern having a second beamwidth narrower than the first beamwidth (see col. 6, lines 18-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine both teachings to arrive at the claimed invention. A motivation for doing so would have been to provide a system wherein a single antenna may be used to generate a large

number of beams, with improved beam coverage and reduced dropoff (Munoz-Garcia col. 3, lines 16-19).

Regarding claim 15, Munoz-Garcia discloses a network node for a distributed wireless access network (see fig. 1), comprising: a steerable array antenna having a plurality of antenna elements (i.e., radiating elements) (see fig. 3, col. 5, lines 22-23) for establishing wireless transit radio links (inherent) with neighbouring network nodes in the distributed wireless access network (i.e., the system comprises at least one satellite in orbit around the Earth, on which are located a plurality of terminals; for example mobile communications terminals and fixed communications terminals. The latter may, for example, comprise Earth stations connected to telecommunications networks) (see col. 3, lines 60-67); a plurality of signal shifters for respective connection to the plurality of antenna elements (i.e., plurality of phase shifters) (see figs. 4-5, col. 6, lines 22-23); and an adaptive beamformer (see col. 2, line 25) for distributing array antenna input signals to the plurality of signal shifters (see fig. 3, col. 5, lines 19-27, and col. 11, lines 4-6, also refer to claim 1 rejection) and combining array antenna output signals from the plurality of signal shifters (see col. 1, lines 41-53, also refer to claim 1 rejection).

Although Munoz-Garcia discloses a network node as described, Munoz-Garcia does not specifically discloses a network node comprising configurable beamwidth comprising in at least a wide beamwidth operating mode associated with an array antenna gain pattern having a first beamwidth and a narrow beamwidth operating mode associated with an array antenna gain pattern having a second beamwidth narrower than the first beamwidth.

However, Gross discloses a system wherein the phase antenna array could be enabled to

operate in a mode having a broad, low power, low bandwidth beam and could also be enabled to operate in a mode having narrow width beams (see col. 6, lines 18-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine both teachings to arrive at the claimed invention. A motivation for doing so would have been to provide a system wherein a single antenna may be used to generate a large number of beams, with improved beam coverage and reduced dropoff (Munoz-Garcia col. 3, lines 16-19).

Regarding claim 16, Munoz-Garcia discloses a network node (see claim 15 rejection), wherein the adaptive beamformer comprises at least a first beamformer for distributing input signals to and combining output signals from a subset of the plurality of signal shifters in an operating mode (i.e., Munoz-Garcia discloses two analogue beam formers, wherein each analogue beam former 20,120 consists of two orthogonally connected stacks. In the beam former, four-port power dividers with associated phase shifters, receiving input signals and feeding a linear array of spaced elements. The dividers each receive two input analogue signals, one of which is phase shifted, and output two RF signals. The effect of the array of dividers and phase shifters is that the RF signal supplied to any one of the inputs is fed, in progressively incrementing phase shifts, to each of the elements of the array. Thus, the array acts as a phased array, generating a beam at an angle dependent upon the phase shift increment (which depends upon the number of radiating elements) and the element spacing. Therefore, one skilled in the art would immediately conceptualize that both beamformers distribute input signals and combining output signals from the plurality of phase shifters (see col. 1, lines 41-53, and col. 5, lines 13-17), and a second beamformer for distributing input signals to and combining output signals from

each of the plurality of signal shifters in another operating mode (see col. 1, lines 41-53, and col. 5, lines 13-17).

Regarding claim 30, Munoz-Garcia discloses a distributed wireless access network (see fig. 1) comprising: a plurality of network access nodes (see fig. 1) and a plurality of wireless transit radio links (inherent) between the network access nodes (see fig. 1) wherein at least one of the network access nodes comprises an electronically steerable high gain array antenna (see fig. 2 and col. 3, lines 60-67).

Although Munoz-Garcia discloses a network as described, Munoz-Garcia does not specifically discloses a network wherein at least one of the network access nodes comprises an electronically steerable high gain array antenna with configurable beamwidth.

However, Gross discloses a system While the satellite is performing its normal mission on orbit, the phased-array antenna could be enabled to operate in a mode in which one or more narrow width, high bandwidth beams are pointed towards or steered towards individual earth-based communications nodes, such as fixed or mobile wireless devices

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine both teachings to arrive at the claimed invention. A motivation for doing so would have been to provide a system wherein a single antenna may be used to generate a large number of beams, with improved beam coverage and reduced dropoff (Munoz-Garcia col. 3, lines 16-19).

Regarding claim 32, Munoz-Garcia discloses a network (see claim 30 rejection) wherein the beamwidth of the array antenna is controlled by different excitations of the array antenna (see col. 7, lines 9-12).

Regarding claim 33, Munoz-Garcia discloses a network (see claim 30 rejection) wherein the array antenna comprises a plurality of diversity transceivers (see fig. 1).

Regarding claim 34, Munoz-Garcia discloses a network (see claim 33 rejection) wherein the diversity transceivers are dual polarized diversity transceivers (see col. 9, lines 49-50), and wherein beams for each polarization direction of the diversity transceivers are steered independently (i.e., the array of beams is to be aligned in two dimensions, it is apparent that a phase shift across the antenna in two dimensions, vertically and horizontally, needs to be applied) (see col. 9, lines 59-62).

Regarding claim 35, Munoz-Garcia discloses a network (see claim 30 rejection) wherein the beamwidth is configurable to provide decreased probability of interference (see col. 4, lines 43-46).

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munoz-Garcia and Gross, in further view of Jespersen, Pub. No. US 20030236068.

The combination discloses a system as described above (see claim 2 rejection).

Although the combination discloses a system as described, the combination does not specifically disclose a system wherein the adaptive beamformer further comprises an input switch connected to the feeding port and to the plurality of beamformers for switching signals between any one of the plurality of beamformers and the feeding port.

However, Jespersen discloses a system wherein the adaptive beamformer further comprises an input switch connected to the feeding port and to the plurality of beamformers for switching signals between any one of the plurality of beamformers and the feeding port (i.e.,

switching arrangement is coupled to the plurality of output ports of the narrowband channelizer and is also coupled to the wideband channelizer. The switching arrangement receives the independent narrowband signals and the wideband signals, and groups together those signals associated with each of the plural downlink antenna beams, to thereby produce combined signals grouped by beam, wherein a coupling arrangement coupled to the switching arrangement and to the corresponding beam input ports of the beamformer. This causes the beamformer and the downlink antenna to route each of the combined signals to the antenna beam for which it is destined) (see page 1 paragraph 6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as described to arrive at the claimed invention. A motivation for doing so would have been to provide a system wherein arrays are being mutually offset so as to produce a combined array of beam directions having a smaller angular spacing.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munoz-Garcia and Gross, in further view of Livingston et al. (Livingston), U.S. Patent No. 6388631.

The combination discloses a system as described above (see claim 3 rejection).

Although the combination discloses a system as described, the combination does not specifically disclose a system wherein the adaptive beamformer further comprises: an input switch connected to the feeding port and to the plurality of beamformers; and a plurality of switches connected to the first beamformer and the second beamformer and respectively connected to each signal shifter in the subset of the plurality of signal shifters, each of the plurality of switches operable to connect each signal shifter in the subset of the plurality of signal

shifters to either the first beamformer or the second beamformer.

However, Livingston discloses a system wherein an input switch connected to the feeding port and to the plurality of beamformers and a plurality of switches connected to the first beamformer and the second beamformer and respectively connected to each signal shifter in the subset of the plurality of signal shifters, each of the plurality of switches operable to connect each signal shifter in the subset of the plurality of signal shifters to either the first beamformer or the second beamformer (i.e., a plurality of switches deployed immediately adjacent to each one of the plurality of non-resonant slot apertures, each switch of the plurality of switches connected to at least one antenna feed, wherein the ability to achieve coarse antenna beam scanning with fewer phase shifters is provided. An RF device may be connected to an array of passive beamformers through the switch, which selects one of the beamformers) (see col. 4, lines 14-19, and col. 13, lines 13-33).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references to arrive at the claimed invention. A motivation for doing so would have been to provide a system wherein arrays are being mutually offset so as to produce a combined array of beam directions having a smaller angular spacing.

6. Claims 7-11, 14, 17-25, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munoz-Garcia and Gross, in further view of Kasami et al. (Kasami), U.S. Patent No. 6400318.

Regarding claim 7, the combination discloses a system as described above (see claim 1 rejection).

Although the combination discloses a system as described, the combination does not specifically disclose a system further comprising: a signal weight calculator configured to calculate signal weights for steering a gain pattern of the array antenna and to output the signal weights to the signal shifters.

However, Kasami discloses a system wherein an adaptive array antenna comprises a plurality of weighting means for weighting received signals, which are received by said antenna elements, by weights which are set, respectively; combining means for combining the received signals weighted by said plurality of weighting means; and weight control means for calculating a weight on the basis of the strength of the received signal detected by said signal strength detecting means, and for setting the calculated weight in each of said plurality of weighting means. The adaptive array antenna also comprises: a phase/amplitude comparator circuit for inputting a demodulated signal from the weight determining individual element demodulator circuit to compare the phases and amplitudes of the respective input signals to determine the differences therebetween; a phase shift control signal output circuit for outputting a control signal to the quadrature modulator of the local signal phase shifter circuit on the basis of the outputs of the phase-shifted amount of the phase deviation compensating control means and phase-shifted amount/amplitude weight operating circuit (see col. 3, line 59 through col. 4, line 3, and col. 32, lines 4-22).

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to ensure that the directional gain of the array antenna would not exceed a predetermined value.

Regarding claim 8, the combination discloses a system as described above (see claim 7 rejection).

Although the combination discloses a system wherein the signal shifters are phase shifters (see Munoz-Garcia's abstract), the combination does not specifically disclose a system, implemented in a network node of a distributed wireless access network, wherein the signal weights are phase weights calculated to steer a gain peak in the gain pattern of the array antenna in a direction of a neighboring network node in the distributed wireless access network.

However, Kasami discloses a system, as related to an adaptive array antenna and a radio base station, for use in the radio communication system, and an adaptive array antenna for use in the radio base station. Kasami also discloses a weight control circuit for weighting amplitude or phase of each of the antenna elements (phase weights), wherein the phases of the transmitted signals are phase-controlled variable phase, so that it is possible to increase the directional gain with respect to the base station. It is possible to increase the directional gain with respect to the terminal station by also using the signals transmitted by the first antenna element when the base station transmits signals (see col. 1, lines 5-9, and col. 23, line 60 through col. 24, line 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to ensure that the directional gain of the array antenna would not exceed a predetermined value.

Regarding claim 9, the combination discloses a system as described above (see claim 8 rejection).

Although the combination discloses a system as described, the combination does not specifically disclose a system wherein the network node further comprises a memory storing a lookup table comprising phase weights for steering the gain peak in the gain pattern of the array antenna in a direction of each neighbouring network node of the network node.

However, Kasami discloses a system further comprises further comprises a memory storing a lookup table comprising phase weights (i.e., amplitude weight from the phase-shifted amount/amplitude weight operating circuit) (see figs. 38 and 40, col. 33, lines 41-51, and col. 35, lines 59-67) for steering the gain peak in the gain pattern of the array antenna in a direction of each neighbouring network node of the network node (see col. 1, lines 5-9, and col. 23, line 60 through col. 24, line 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to ensure that the directional gain of the array antenna would not exceed a predetermined value.

Regarding claim 10, the combination discloses a system as described above (see claim 7 rejection).

Although the combination discloses a system as described, the combination does not specifically disclose a system, implemented in a network node of a distributed wireless access network, wherein the signal shifters are combined amplitude and phase shifters, and wherein the signal weights are complex weights comprising amplitude components and phase components calculated based on a location of an interference source in the distributed wireless access

network to steer a null in the gain pattern of the array antenna in a direction of the interference source.

However, Kasami discloses a system implemented in a network node of a distributed wireless access network (i.e., related to an adaptive array antenna and a radio base station, for use in the radio communication system, and an adaptive array antenna for use in the radio base station) (see col. 1, lines 5-9), wherein the signal shifters are combined amplitude and phase shifters, and wherein the signal weights are complex weights comprising amplitude components and phase components (i.e., a phase/amplitude comparator circuit for inputting a demodulated signal from the weight determining individual element demodulator circuit to compare the phases and amplitudes of the respective input signals to determine the differences therebetween) (see fig. 37, col. 33, lines 5-10) calculated based on a location of an interference source in the distributed wireless access network to steer a null in the gain pattern of the array antenna in a direction of the interference source (i.e., determine the constraint direction of the null by previously acquiring the positional information for other base stations, and by detecting the direction of a terminal station communicating with the self-base station at a first call stage by utilizing that the outline of the interference wave incoming direction can be acquired if the terminal uses a directional antenna, or by quoting the positional information for other base stations from a previously registered data base) (see col. 26, line 62 through col. 27, line 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 11, the combination, Munoz-Garcia and Gross, discloses a system as described above (see claim 7 rejection).

Although the combination discloses a system as described, the combination does not specifically disclose a system, implemented in a network node of a distributed wireless access network, wherein the signal shifters are combined amplitude and phase shifters, and wherein the signal weights are complex weights comprising amplitude components and phase components calculated to steer a null in the gain pattern of the array antenna in a direction of an interference source in the distributed wireless access network and to steer a gain peak in the gain pattern of the array antenna in a direction of a neighbouring network node in the distributed wireless access network.

However, Kasami discloses a system implemented in a network node of a distributed wireless access network (i.e., related to an adaptive array antenna and a radio base station, for use in the radio communication system, and an adaptive array antenna for use in the radio base station) (see col. 1, lines 5-9), wherein the signal shifters are combined amplitude and phase shifters, and wherein the signal weights are complex weights comprising amplitude components and phase components (i.e., a phase/amplitude comparator circuit for inputting a demodulated signal from the weight determining individual element demodulator circuit to compare the phases and amplitudes of the respective input signals to determine the differences therebetween) (see fig. 37, col. 33, lines 5-10) calculated to steer a null in the gain pattern of the array antenna in a direction of an interference source in the distributed wireless access network (see col. 26, line 62 through col. 27, line 3) and to steer a gain peak in the gain pattern of the array antenna in a direction of a neighbouring network node in the distributed wireless access network the number

of constraint conditions can be decreased by using a method for adding only the direction of a base station, which can be presumed that the level of the interference wave is maximum, of a plurality of other base stations, to the constraint conditions in addition to propagation conditions, such as the gain and distance of the adaptive array antenna, and the status of unobstructed view to a corresponding base station, or adding a direction, which is obtained by weighting and averaging the above described conditions of a plurality of base stations, to the constraint conditions, or adding the substantially center between both ends of the directions of the plurality of base stations to the constraint conditions (see col. 27, lines 40-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 14, the combination, Munoz-Garcia and Gross, discloses a system as described above (see claim 1 rejection).

Although Gross discloses a system in which the adaptive beamformer operates in two operating modes (see col. 17, lines 1-7), wherein the adaptive beamformer operates in the first operating mode to scan for communication request (i.e. searching mode) (see col. 17, lines 1-5), Munoz-Garcia and Gross do not specifically disclose a system implemented in a network node of a distributed wireless access network, the network node having at least one neighbouring network node, wherein the adaptive beamformer operates in a second operating mode for communicating with the at least one neighbouring node.

However, Kasami discloses a system implemented in a network node of a distributed wireless access network (i.e., related to an adaptive array antenna and a radio base station, for use in the radio communication system, and an adaptive array antenna for use in the radio base station) (see col. 1, lines 5-9), the network node having at least one neighbouring network node (i.e., a plurality of terminal stations with respect to one base station) (see col. 1, lines 14-15), and wherein the adaptive beamformer operates in a operating mode for communicating with the at least one neighbouring node (i.e., a real number weight control is applied to a receiving adaptive array antenna of a base station, there is considered a method for controlling a real number weight of real number weighting means to calculate a real number weight suppressing the co-channel interference before a communication channel is given to a terminal station having requested communication, and thereafter, giving the communication channel to the terminal station) (see col. 40, lines 57-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 17, the combination (Munoz-Garcia and Gross) discloses a network node as described above (see claim 15 rejection).

Although the combination discloses a network node wherein the signal shifters are phase shifters (refer to claim 1 rejection, as related to phase shifters), and comprising a first antenna beam from a phased antenna array, the first antenna beam having a first beam width; providing a second antenna beam from a second phased antenna array, the second antenna beam having a

second beam width and being offset from the first antenna beam by a squint angle (narrower beam width), said first antenna beam overlapping at least partially with said second antenna beam (see col. 2, lines 54-60, and col. 4, lines 24-28), the combination does not specifically disclose a network node further comprising a phase weight calculator configured to calculate phase weights for steering a gain peak in the array antenna gain pattern having the second beamwidth toward one of the neighbouring nodes, and to output the phase weights to the phase shifters in the narrow beamwidth operating mode.

However, Kasami discloses a system wherein an adaptive array antenna comprises a plurality of weighting means for weighting received signals, which are received by said antenna elements, by weights which are set, respectively; combining means for combining the received signals weighted by said plurality of weighting means; and weight control means for calculating a weight on the basis of the strength of the received signal detected by said signal strength detecting means, and for setting the calculated weight in each of said plurality of weighting means. The adaptive array antenna also comprises: a phase/amplitude comparator circuit for inputting a demodulated signal from the weight determining individual element demodulator circuit to compare the phases and amplitudes of the respective input signals to determine the differences therebetween; a phase shift control signal output circuit for outputting a control signal to the quadrature modulator of the local signal phase shifter circuit on the basis of the outputs of the phase-shifted amount of the phase deviation compensating control means and phase-shifted amount/amplitude weight operating circuit (see col. 3, line 59 through col. 4, line 3, and col. 32, lines 4-22), wherein the phases of the transmitted signals are phase-controlled variable phase, so that it is possible to increase the directional gain with respect to the base

station. It is possible to increase the directional gain with respect to the terminal station by also using the signals transmitted by the first antenna element when the base station transmits signals (see col. 1, lines 5-9, and col. 23, line 60 through col. 24, line 2).

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to ensure that the directional gain of the array antenna would not exceed a predetermined value.

Regarding claim 18, the combination, Munoz-Garcia and Gross, discloses a system as described above (see claim 15 rejection).

Although the combination discloses a network node wherein the signal shifters are phase shifters (refer to claim 1 rejection as related to phase shifter), and comprising a first antenna beam from a phased antenna array, the first antenna beam having a first beam width; providing a second antenna beam from a second phased antenna array, the second antenna beam having a second beam width and being offset from the first antenna beam by a squint angle (narrower beam width), said first antenna beam overlapping at least partially with said second antenna beam (see Gross col. 2, lines 54-60, and col. 4, lines 24-28), the combination does not specifically disclose a network node wherein a complex weight calculator configured to calculate complex weights comprising phase weights and amplitude weights for steering a null in the array antenna gain pattern having the second beamwidth toward an interference source in the distributed wireless access network, and to output the phase weights to the phase shifters and the amplitude weights to the second beamformer in the narrow beamwidth operating mode.

However, Kasami discloses a system comprising of a complex weight calculator configured to calculate complex weights comprising phase weights and amplitude weights (i.e., a phase/amplitude comparator circuit for inputting a demodulated signal from the weight determining individual element demodulator circuit to compare the phases and amplitudes of the respective input signals to determine the differences therebetween) (see fig. 37, col. 33, lines 5-10) for steering a null in the array antenna gain pattern having the second beamwidth toward an interference source in the distributed wireless access network (see col. 26, line 62 through col. 27, line 3) to output the phase weights to the phase shifters and the amplitude weights to the second beamformer in the narrow beamwidth operating mode (see col. 27, lines 40-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 19, the combination, Munoz-Garcia and Gross, discloses a system as described above (see claim 15 rejection).

Although Gross discloses a system in which the antenna array operates in two operating modes (see col. 17, lines 1-7), and comprising a first antenna beam from a phased antenna array, the first antenna beam having a first beam width; providing a second antenna beam from a second phased antenna array, the second antenna beam having a second beam width and being offset from the first antenna beam by a squint angle (narrower beam width) (see Gross col. 2, lines 54-60, and col. 4, lines 24-28) wherein the antenna array is operative to operate in an operating mode to scan for communication request (i.e. searching mode) (see col. 17, lines 1-5),

Munoz-Garcia and Gross do not specifically disclose a network node wherein the array antenna is operated in the wide beamwidth operating mode during a listening function to scan the neighbouring network nodes and in the narrow beamwidth operating mode during a communication function over a wireless transit radio link.

However, Kasami discloses a system wherein the network node having at least one neighbouring network node (i.e., a plurality of terminal stations with respect to one base station) (see col. 1, lines 14-15), and wherein the array antenna is operative to operate in a operating mode for communication over a wireless transit radio link (i.e., a real number weight control is applied to a receiving adaptive array antenna of a base station, there is considered a method for controlling a real number weight of real number weighting means to calculate a real number weight suppressing the co-channel interference before a communication channel is given to a terminal station having requested communication, and thereafter, giving the communication channel to the terminal station) (see col. 40, lines 57-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 20, Munoz-Garcia discloses a method of operating an array antenna (see abstract), comprising transmitting communication signals over the formed beam to the destination wireless access routing point (see col. 5, lines 1-12), and directing the formed beam toward the destination wireless access routing point (see col. 1, lines 13-16).

Gross discloses a method comprising an array antenna having configurable beamwidth, and comprising listening for communication requests using a first beamwidth of the array antenna) (see col. 2, lines 54-60, and col. 4, lines 24-28, and col. 17, lines 1-5), and forming a beam having a second beamwidth narrower than the first beamwidth (see col. 2, lines 54-60, and col. 4, lines 24-28).

Although Munoz-Garcia and Gross disclose a method as described, the combination does not specifically disclose a method comprising receiving a communication request identifying a destination wireless access routing point in the wireless communication network.

However, Kasami discloses a method wherein after the direction of the terminal can be substantially identified or after the weighting coefficient substantially converges at the optimum weighting coefficient, when beams are combined so as to be directed to that direction, the signal strength after the combining is stable so that the variation in the strength is small, and controlling real number weight of real number weighting means to calculate a real number weight suppressing the co-channel interference before a communication channel is given to a terminal station having requested communication (see col. 34, lines 4-13, and col. 40, lines 59-63).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 21, Munoz-Garcia discloses a method (see claim 20 rejection) wherein the array antenna comprises a plurality of antenna elements (see abstract), and listening

comprises exciting a subset of the plurality of antenna elements (selectively exciting each input) (see col. 1, lines 54-55).

Regarding claim 22, Munoz-Garcia discloses a method (see claim 21 rejection) wherein forming comprises exciting each of the plurality of antenna elements (see col. 1, lines 54-55).

Regarding claim 23, the combination discloses a method as described above (see claim 20 rejection).

Although the combination discloses a method comprising applying the phase shifts to respective excitation signals of the plurality of antenna elements (i.e., if multiple first ports are simultaneously excited, a grid of beams at incrementally shifted alignment angles are created, each one corresponding uniquely to the signal at one of the first ports) (see Munoz-Garcia col. 7, lines 9-12), the combination does not specifically disclose a method wherein directing comprises: accessing a lookup table to retrieve phase shifts for the plurality of antenna elements to steer the formed beam toward the destination wireless access routing point.

However, Kasami discloses a system further comprises further comprises a memory storing a lookup table comprising phase weights (i.e., amplitude weight from the phase-shifted amount/amplitude weight operating circuit) (see figs. 38 and 40, col. 33, lines 41-51, and col. 35, lines 59-67) for steering the gain peak in the gain pattern of the array antenna in a direction of each neighbouring network node of the network node (see col. 1, lines 5-9, and col. 23, line 60 through col. 24, line 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation

for doing so would have been to ensure that the directional gain of the array antenna would not exceed a predetermined value.

Regarding claim 24, the combination discloses a method as described above (see claim 22 rejection).

Although the combination discloses a method comprising applying the phase shifts to respective excitation signals of the plurality of antenna elements (i.e., if multiple first ports are simultaneously excited, a grid of beams at incrementally shifted alignment angles are created, each one corresponding uniquely to the signal at one of the first ports) (see Munoz-Garcia col. 7, lines 9-12), the combination does not specifically disclose a method wherein directing comprises: calculating phase shifts for the plurality of antenna elements to steer the formed beam toward the destination wireless access routing point.

However, Kasami discloses a system, as related to an adaptive array antenna and a radio base station, for use in the radio communication system, and an adaptive array antenna for use in the radio base station. Kasami also discloses a weight control circuit for weighting amplitude or phase of each of the antenna elements (phase weights), wherein the phases of the transmitted signals are phase-controlled variable phase, so that it is possible to increase the directional gain with respect to the base station. It is possible to increase the directional gain with respect to the terminal station by also using the signals transmitted by the first antenna element 11 when the base station transmits signals (see col. 1, lines 5-9, and col. 23, line 60 through col. 24, line 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation

for doing so would have been to ensure that the directional gain of the array antenna would not exceed a predetermined value.

Regarding claim 25, the combination discloses a method as described above (see claim 20 rejection).

Although the combination discloses a method as described, the combination does not specifically disclose a method further comprising: determining a location of an interferer; and directing a null toward the interferer.

However, Kasami discloses a method wherein the signal weights are calculated based on a location of an interference source in the distributed wireless access network to steer a null in the direction of the interference source (i.e., determine the constraint direction of the null by previously acquiring the positional information for other base stations, and by detecting the direction of a terminal station communicating with the self-base station at a first call stage by utilizing that the outline of the interference wave incoming direction can be acquired if the terminal uses a directional antenna, or by quoting the positional information for other base stations from a previously registered data base) (see col. 26, line 62 through col. 27, line 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 27, Gross discloses a method (see claim 25 rejection) wherein determining a location of an interferer comprises scanning a wireless access area (see col. 9, lines 48-53, also refer to claim 25 rejection).

Regarding claim 28, the combination, Munoz-Garcia and Gross, discloses a method as described above (see claim 25 rejection).

Although the combination discloses a method comprising applying the phase shifts and the amplitude shifts to respective excitation signals of the plurality of antenna elements (i.e., if multiple first ports are simultaneously excited, a grid of beams at incrementally shifted alignment angles are created, each one corresponding uniquely to the signal at one of the first ports) (see Munoz-Garcia col. 7, lines 9-12), the combination does not specifically disclose a method wherein directing a null toward the interferer comprises: calculating phase shifts and amplitude shifts for the plurality of antenna elements to steer the null toward the interferer.

However, Kasami discloses a method comprises calculating phase shifts and amplitude shifts for the plurality of antenna elements (see fig. 37, col. 33, lines 5-10) to steer the null toward the interferer (i.e., determine the constraint direction of the null by previously acquiring the positional information for other base stations, and by detecting the direction of a terminal station communicating with the self-base station at a first call stage by utilizing that the outline of the interference wave incoming direction can be acquired if the terminal uses a directional antenna, or by quoting the positional information for other base stations from a previously registered data base) (see col. 26, line 62 through col. 27, line 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings as disclosed to arrive at the claimed invention. A motivation for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

Regarding claim 29, Munoz-Garcia discloses a system of operating an array antenna (see abstract) comprising means for exciting the array antenna to form beams (selectively exciting each input) (see col. 1, lines 54-55); means for transmitting communication signals over the formed beam to the destination wireless access routing point (see col. 5, lines 1-12), and means for directing the formed beam toward the destination wireless access routing point (see col. 1, lines 13-16).

Gross discloses a system comprising listening for communication requests using a first beamwidth of the array antenna) (see col. 2, lines 54-60, and col. 4, lines 24-28, and col. 17, lines 1-5), and forming a beam having a second beamwidth narrower than the first beamwidth (see col. 2, lines 54-60, and col. 4, lines 24-28).

Although Munoz-Garcia and Gross disclose a method as described, the combination does not specifically disclose a system comprising means for receiving a communication request identifying a destination wireless access routing point in the wireless communication network

However, Kasami discloses a system wherein after the direction of the terminal can be substantially identified or after the weighting coefficient substantially converges at the optimum weighting coefficient, when beams are combined so as to be directed to that direction, the signal strength after the combining is stable so that the variation in the strength is small, and controlling real number weight of real number weighting means to calculate a real number weight suppressing the co-channel interference before a communication channel is given to a terminal station having requested communication (see col. 34, lines 4-13, and col. 40, lines 59-63).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references as disclosed to arrive at the claimed invention. A motivation

for doing so would have been to reduce the control processing during communication (see col. 27, lines 3-4).

7. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munoz-Garcia, Gross, and Kasami in further view of Yu, U.S. Patent No. 6661366.

The combination discloses a method as described above (see claim 25 rejection).

Although the combination discloses a method as described, the combination does not specifically disclose a method wherein determining a location of an interferer comprises accessing a lookup table to retrieve a bearing angle of the interferer.

However Yu discloses a method wherein in the beamforming network, each of the N input signals is split into two paths, linearly weighted, and then added together. The DOA of a target signal is determined by evaluating (e.g., from a look up table or from a graph) the ratio of the difference signal over the sum signal (see col. 2, lines 39-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the references to arrive at the claimed invention. A motivation for doing so would have been to ensure the proper identification of the source of the interference.

8. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munoz-Garcia and Gross in further view of Berger et al. (Berger), U.S. Patent No. 6426814.

The combination discloses a network as described above (see claim 30 rejection).

Although the combination discloses a network as described, the combination does not specifically disclose a network wherein at least one of the network access nodes is connected to a broadband wireline backbone connection.

However, Berger discloses a network comprising a router for switched array antennas for high capacity wireless broadband networks.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings to arrive at the claimed invention. A motivation for doing so would have been to provide a network capable of handling frequencies greater than those required for high-grade voice communications.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pierre-Louis Desir whose telephone number is (571) 272-779. The examiner can normally be reached on Monday-Friday 8:00AM- 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Feild can be reached on (571) 272-4090. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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03/04/2006

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